PATENT
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Tanaka et al.

Application No. 10/038,918

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Art Unit: 1645

Examiner: Unassigned

For: NOVEL PROTEOME ANALYSIS
METHOD AND DEVICES THEREFOR

PENDING CLAIMS AFTER ENTRY OF PRELIMINARY AMENDMENT

1. A proteome analysis method comprising grouping a proteome into membrane proteins and compounds capable of interacting with the membrane proteins, while retaining their native structure and function, and analyzing both the membrane proteins and the compounds based on biological affinity.

2. A proteome analysis method comprising analyzing, based on biological affinity, both membrane proteins and compounds capable of interacting therewith, which method comprising:

(1) subjecting an analyte including the compounds to gel electrophoresis, and transferring the analyte including the compounds from the gel onto a support and immobilizing the analyte thereon while retaining their native function;

(2) preparing a lipid bilayer by isolating a membrane fraction having the membrane proteins from a biological sample or fusing the membrane fraction with liposomes;

(3) bringing the membrane proteins embedded in the lipid bilayer according to (2) in contact with the analyte including the compounds immobilized on the support according to (1) to trap said membrane proteins capable of interacting with said compounds with the lipid bilayer; and

(4) analyzing by a means capable of obtaining at least a piece of physical or chemical information of both or either of the membrane proteins trapped with the lipid bilayer according to (3) and the compounds immobilized on the support according to (1) .

3. The method of claim 2, wherein the means is selected from the group consisting of mass spectrometry, fluorescent method, RI method and surface plasmon resonance method.

4. The method of claim 2, wherein the support is selected from the group consisting of a plate, a non-magnetic particle and a magnetic particle.

5. A support for immobilizing compounds capable of interacting with membrane proteins after gel electrophoresis, which support has spacers on its surface to bind the compounds covalently or non-covalently while retaining the native function of the compounds.

6. A proteome analysis device comprising at least the following devices:

(a) a device for transferring an analyte including compounds capable of interacting with membrane proteins from an electrophoresed gel onto a support for immobilizing the compounds while retaining the native function of said compounds;

(b) a device for preparing a lipid bilayer for embedding the membrane proteins;

(c) a device for trapping the membrane proteins embedded in the lipid bilayer, which are capable of interacting with the compounds immobilized on the support, by bringing said membrane proteins in contact with said compounds;

(d) a device for obtaining at least a piece of physical or chemical information of both or each of said membrane proteins and said compounds.

7. The proteome analysis device of claim 6 wherein the device capable of obtaining at least a piece of physical or chemical information of said membrane proteins and/or said

compounds is selected from the group consisting of mass spectrometry, fluorescent method, RI method and surface plasmon resonance method.

8. The proteome analysis device of claim 6 wherein the support is selected from the group consisting of a plate, a non-magnetic particle and a magnetic particle.

9. A plate for mass spectrometry, comprising proteins immobilized thereon by bringing the gel contact with said plate after electrophoresis.

10. A method for identifying membrane proteins and/or compounds capable of interacting therewith that show disease-specific changes in amount or property, which method comprises subjecting a sample collected from an organism suffering from a certain disease to the proteome analysis method of claim 2, and comparing the obtained analysis data with the data of a healthy homologous organism.

11. A method for constructing a database, which comprises applying the method of claim 10 with regard to at least one disease, and pooling the obtained data.

12. A database constructed by the method of claim 11.

13. A method for determining a disease of a target organism for diagnosis, which comprises the following steps:

(1) subjecting a sample collected from an organism suffering from a certain disease to the proteome analysis of claim 1, and comparing the obtained analysis data with the data of a healthy homologous organism, and identifying membrane proteins and/or compounds capable of interacting therewith that show disease-specific changes in amount or property;

(2) applying the step of (1) with regard to at least one disease, and pooling the obtained data to construct a database; and

(3) subjecting a sample collected from a diagnostic target organism to the step (1), and comparing the obtained data with the data pooled in the database for diagnosis, which is constructed according to the step (2), thereby to determine the disease of the target.

14. A system for determining a disease of a diagnostic target organism, which comprises at least the following devices:

(a) a device for transferring an analyte including compounds capable of interacting with membrane proteins from an electrophoresed gel onto a support for immobilizing said compounds while retaining the native function of said compounds;

(b) a device for preparing a lipid bilayer for embedding membrane proteins;

(c) a device for trapping the membrane proteins embedded in the lipid bilayer, by bringing said membrane proteins in contact with said compounds immobilized on the support;

(d) a device for obtaining at least a piece of physical or chemical information of both or each of said membrane proteins and said compounds;

(e) the database of claim 12.

15. A library of membrane proteins embedded in liposome.

16. The library of claim 15, wherein the membrane proteins comprise at least GPI anchor type receptors, G protein-coupled receptors, and oligomer type receptors.

17. The library of claim 15, wherein the membrane protein-embeded liposome has a diameter of 10 to 5,000 nm.

18. The library of claim 15, wherein the membrane protein-embedded liposome has a diameter of 10 to 500 nm.